CLAIMS

1. A method for etching a III-V semiconductor material comprising:

placing a semiconductor substrate on which said III-V semiconductor material has been deposited into a reactive ion etching reactor;

introducing a first gas chosen from HBr, HI and IBr into said reactive ion etching reactor;

introducing a second gas of CH_4 into said reactive ion etching reactor;

introducing a third gas of H_2; and

exposing a portion of said III-V semiconductor material to be etched to a mixture comprising said first, said second and said third gas.

2. The method of Claim 1 further comprising the etching of vertical features into said III-V semiconductor material.

3. The method of Claim 1 wherein the percentage of said first gas is in the range from about 2 to 75 percent by volume.

4. The method of Claim 1 wherein the percentage of said second gas is in the range from about 5 to 50 percent by volume.

5. The method of Claim 1 wherein the percentage of said third gas is in the range from about 5 to 40 percent by volume.

6. The method of Claim 1 wherein said reactive ion etching reactor is maintained at a pressure in the range from about 1 to 30 mTorr.

7. The method of Claim 1 wherein the DC bias for said reactive ion etching reactor is in the range from about 100 to 500 volts.

8. The method of Claim 2 wherein said vertical features have an aspect ratio greater than ten.

9. The method of Claim 1 further comprising the step of growing a mask onto said III-V semiconductor material.

10. The method of Claim 9 wherein said mask comprises silicon.

11. The method of Claim 10 wherein said mask is made of Si_3N_4.

12. A method for etching a III-V semiconductor substrate comprising:
placing said semiconductor substrate into a reactive ion etching reactor;
introducing a first gas chosen from HBr, HI and IBr into said reactive ion etching reactor;
introducing a second gas of CH_4 into said reactive ion etching reactor;
introducing a third gas of H_2; and
exposing a portion of said III-V semiconductor substrate to be etched to a mixture comprising said first, said second and said third gas.

13. The method of Claim 12 further comprising the step of etching vertical features into said III-V semiconductor material.

14. The method of Claim 12 wherein the percentage of said first gas is in the range from about 2 to 75 percent by volume.

15. The method of Claim 12 wherein the percentage of said second gas is in the range from about 5 to 50 percent by volume.

16. The method of Claim 12 wherein the percentage of said third gas is in the range from about 5 to 40 percent by volume.

17. The method of Claim 12 wherein said reactive ion etching reactor is maintained at a pressure in the range from about 1 to 30 mTorr.

18. The method of Claim 12 wherein the DC bias for said reactive ion etching reactor is in the range from about 100 to 500 volts.

19. The method of Claim 13 wherein said vertical features have an aspect ratio greater than ten.

20. The method of Claim 12 further comprising the step of growing a mask onto said III-V semiconductor substrate.